

REMARKS

The Office Action mailed February 6, 2007, has been received and reviewed. Claims 38, 47, 51 and 55 are currently pending in the application. Claims 38, 47, 51 and 55 stand rejected. No claims have been amended. Applicant respectfully requests reconsideration of the application in view of the arguments set forth herein below.

35 U.S.C. § 103(a) Obviousness Rejections

Obviousness Rejection Based on U.S. Patent No. 5,663,608 to Jones et al. in view of U.S. Patent No. 5,909,635 to Marieb et al.

Claims 38, 47, 51, and 55 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Jones et al. (U.S. Patent No. 5,663,608) in view of Marieb et al. (U.S. Patent No. 5,909,635). Applicant respectfully traverses this rejection, as hereinafter set forth.

M.P.E.P. 706.02(j) sets forth the standard for a Section 103(a) rejection:

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

A *prima facie* obviousness rejection based upon a combination of references can only be supported if the combination of references teach or suggest all of the recitations of the claims and if there is some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify or combine the reference teachings. *See*, M.P.E.P. § 2142 (citing, *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991)). Applicant submits that the combination of Jones et al. with Marieb et al. fails to teach or suggest all of the recitations of the claims. Further, no motivation exists to combine Jones et al. with Marieb et al. The lack of teaching when the references are combined, and even the lack of

motivation to combine, precludes a *prima facie* obviousness rejection of claims 38, 47, 51, and 55.

The combination of Jones et al. with Marieb et al. fails to teach or suggest all of the recitations of the claims.

Claim 38 recites, in part, “a conductor...including a first part and a second part, the first part comprising chromium, the second part comprising aluminum, the first part being completely wrapped around the second part.” Neither Jones et al., Marieb et al., or the combination of the two references teach or suggest at least “the first part comprising chromium, the second part comprising aluminum, the first part being completely wrapped around the second part” as recited in claim 38.

The Examiner asserts in the outstanding Office Action that Jones et al. teaches “the conductor including a first part, and a second part, the first part comprising chromium and the second part comprising aluminum (lines 63-65 of column 22)...the first part (Cr) is covering upper and lower surface of the second part.” *Office Action* at p. 3. Applicant respectfully asserts that Jones et al. fails even to teach the first part comprising chromium and the second part comprising aluminum, as asserted by the Examiner. Jones et al., at Col. 22, lines 63-35, states that the “first metal is typically Cr (100 nm)—Cu (500 nm)—Cr (100 nm) but other conductors such as aluminum+4% copper may be used.” Jones et al. is expressly teaching that the first metal may be Cr (100 nm)—Cu (500 nm)—Cr (100 nm) or the first metal may be another conductor such as aluminum+4% copper. Jones et al. does not teach or suggest that the aluminum+4% copper can be sandwiched between two Cr layers. The only sandwiched material taught by Jones is the Cr—Cu—Cr first metal. Thus, Jones et al. fails to teach or suggest “the first part comprising chromium, the second part comprising aluminum,” as recited in claim 38.

Additionally, Applicant respectfully asserts that Marieb et al. at least fails to teach or suggest “the first part comprising chromium, the second part comprising aluminum, the first part being completely wrapped around the second part.” The Office Action relies on Marieb et al. to teach “a multilayer structure of interconnect conductive layer on a semiconductor substrate” and “that an interconnect layer (110) of aluminum copper alloy has been completely wrapped around

all sides by a second conductive material (see Fig 1D, lines 33-34 of column 3)” in order to prevent hillocking from the side walls. *See, Office Action* at p. 3.

Marieb et al. teaches cladding an interconnect for improved electromigration performance. More particularly, Marieb et al. teaches coating an aluminum copper alloy with titanium which chemically reacts with the aluminum copper alloy to create a TiAl_3 cladding layer. Marieb et al. teaches coating the aluminum with a material that readily reacts chemically with aluminum, such as titanium, to create the cladding layer. *See, Marieb et al.* at Col. 3, lines 3-34. In this manner Marieb et al. fails to teach or suggest that its “first part” is chromium that is “completely wrapped around the second part” as recited in claim 38.

In an alternate embodiment, Marieb et al. teaches the use of a cladding layer made of titanium nitride, tungsten and titanium tungsten. *See Id.* at Col. 4, lines 25-49. Thus, the alternate embodiment also fails to teach or suggest that its “second part” is aluminum with a “first part” of chromium being completely wrapped around the “second part,” as recited in claim 38.

Jones et al., combined with Marieb et al. fail at least to teach or suggest “a conductor...including a first part and a second part, the first part comprising chromium, the second part comprising aluminum, the first part being completely wrapped around the second part,” as recited in independent claim 38. Independent claims 47 and 51 similarly recite, in part, “a conductor...including a first part and a second part, the first part comprising chromium, the second part comprising aluminum, the first part forming a sheath completely wrapped around an upper surface, a lower surface, a left edge, and a right edge of the second part.” Additionally, independent claim 55 similarly recites, in part, “a network of conductors...comprising a first conductive material comprising chromium and a second conductive material comprising aluminum, the first conductive material forming a sheath completely wrapped around at least a portion of the second conductive material.” As discussed above, Jones et al., Marieb et al., and the combination of the two fails to teach or suggest these recitations of claims 47, 51, and 55.

Jones et al. and Marieb et al., when combined, do not teach or suggest “a conductor...including a first part and a second part, the first part comprising chromium, the second part comprising aluminum, the first part being completely wrapped around the second part,” as recited in independent claim 38. Similarly, Jones et al. and Marieb et al., when

combined, fail to teach or suggest “a conductor...including a first part and a second part, the first part comprising chromium, the second part comprising aluminum, the first part forming a sheath completely wrapped around an upper surface, a lower surface, a left edge, and a right edge of the second part,” as recited in independent claims 47 and 51. Furthermore, Jones et al. and Marieb et al., when combined, do not teach or suggest “a network of conductors...comprising a first conductive material comprising chromium and a second conductive material comprising aluminum, the first conductive material forming a sheath completely wrapped around at least a portion of the second conductive material,” as recited in independent claim 55.

Accordingly, Applicant respectfully asserts that independent claims 38, 47, 51, and 55 could not have been obvious to a person of ordinary skill in the art at the time the invention was made considering Jones et al. in view of Marieb et al., and requests that the Examiner withdraw the rejection of independent claims 38, 47, 51, and 55 under 35 U.S.C. § 103(a).

No Motivation Exists to Combine Jones et al. with Marieb et al.

Even if the combination of references taught or suggested all of the recitations of the claims, which they do not, there is still a lack of sufficient motivation or suggestion to combine Jones et al. with Marieb et al. to support a *prima facie* obviousness rejection.

“[I]t is fundamental that rejections under 35 U.S.C. § 103 must be based on evidence.” *See, In re Lee*, 61 U.S.P.Q.2d 1430, 277 F.3d 1338, 1342 (Fed. Cir. 2002). This evidence “must be based on objective evidence of record.” *Id.* at 1343. When patentability depends on a question of obviousness, “rigorous application of the requirement for a showing of the teaching or motivation to combine prior art references” is “the best defense against the subtle but powerful attraction of a hindsight-based obviousness analysis.” *Id.* This rigorous showing requires the Examiner to “explain the reasons one of ordinary skill in the art would have been motivated to select the references and to combine them to render the claimed invention obvious.” *Id.* In other words, the motivation to combine can not “be resolved on subjective belief and unknown authority.” *Id.* at 1344. Furthermore, the Examiner “cannot rely on conclusory statements when dealing with particular combinations of prior art and specific claims, but must set forth the rationale on which it relies.” *Id.* at 1345.

The Office Action makes only one allegation in an effort to support its rationale for motivation to combine the references. The Office Action alleges that “it would have been obvious to one having ordinary skill in the art at the time the invention was made to wrap the second part completely by the first part as taught by Marieb et al. since this will prevent hillocking from all sides of the interconnect wire, thus prevents electromigration [sic].” *See, Office Action* at p. 3-4. The only support or evidence that the Final Action alleges as support for motivation to combine Jones et al. with Marieb et al. is the teachings of Marieb et al. and, in particular, the teaching that wrapping or surrounding an interconnect wire will prevent hillocking and electromigration.

To provide a motivation or suggestion to combine, the prior art or the knowledge of a person of ordinary skill in the art must “suggest the desirability of the combination” or provide “an objective reason to combine the teachings of the references.” *See, M.P.E.P. § 2143.01.* “The teaching, suggestion, or motivation [to combine references] must be found either explicitly or implicitly in the references themselves or in the knowledge generally available to one of ordinary skill in the art.” *Id.* The motivation alleged by the Examiner does not suggest an objective reason to combine Jones et al. with Marieb et al. While the teachings of Marieb et al., as recognized by the Examiner, may indicate that the wrapping of an interconnect prevents hillocking and electromigration, the teachings of Jones et al. express no desire to alleviate such problems, and in fact fail to even recognize that hillocking or electromigration problems may exist with the Jones et al. structures. Hypothetically, if Jones et al. recognized that hillocking of its interconnect structures was a problem, then a combination of Jones et al. with Marieb et al. may be motivated because Marieb et al. could supply a solution to a problem recognized by Jones et al. The facts are, however, that Jones et al. does not recognize or even allude to problems with hillocking or electromigration in its structures. Without some explicit or implicit teaching, suggestion, or motivation in Jones et al. to seek out solutions to non-existent hillocking and electromigration problems that Marieb et al. may solve, an objective reason to combine Jones et al. with Marieb et al. does not exist.

The motivation alleged in the Office Action – elimination or reduction of hillocking and electromigration – does not support a combination of references unless it is also considered in

view of Applicant's specification, which constitutes improper hindsight. The only apparent, objective reason for combining Marieb et al. with Jones et al. are the suggestions of Applicant's specification. Without the teachings found in Applicant's specification and claims, a person of skill in the art would not combine Marieb et al. with Jones et al. The use of Applicant's specification to motivate a combination of references is improper and does not support a *prima facie* obviousness rejection.

The lack of any suggestion or motivation to combine Marieb et al. with Jones et al. precludes a *prima facie* obviousness rejection of claims 38, 47, 51, and 55 under 35 U.S.C. § 103(a). *See, In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). Applicant, therefore, respectfully requests that the Examiner withdraw the rejection of independent claims 38, 47, 51, and 55 under 35 U.S.C. § 103(a).

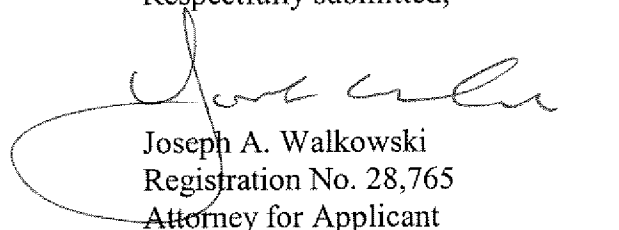
ENTRY OF NEW CLAIMS

The new claims 59 through 63 above should be entered by the Examiner because the new claims are supported by the as-filed specification and drawings and do not add any new matter to the application. Further, the amendments do not raise new issues or require a further search. Each of new claims 59 through 63 is allowable, at least by virtue of being dependent from an allowable base claim.

CONCLUSION

Claims 38, 47, 51, 55 and 59 through 63 are believed to be in condition for allowance, and an early notice thereof is respectfully solicited. Should the Examiner determine that additional issues remain which might be resolved by a telephone conference, he is respectfully invited to contact Applicant's undersigned attorney.

Respectfully submitted,



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